THE LIFE-HISTORIES OF THE NEW YORK SLUG CATERPILLARS.—XII.

PLATE IX, FIGS. 1–10.

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Apoda biguttata *Packard.*

1864—*Limacodes biguttata* PACKARD, Proc. Ent. Soc. Phil. III, 341.
1865—*Limacodes tetraspilaris* WALKER, Cat. Brit. Mus. XXXII, 486.
1874—*Limacodes biguttata* STRETCH, Zyg. & Bomb. N. A. pl. 8, fig. 16.
1882—*Limacodes biguttata* GROTE, Check List.
1892—*Apoda biguttata* KIRBY, Cat. Lep. Het. I, p. 553.
1894—*Apoda biguttata* NEUMOGEN & DYAR, Journ. N. Y. Ent. Soc. II, 73.

LARVA.

1894—DYAR, Ann. N. Y. Acad. Sci. VIII, 221 (as *A. y-inversa*).

SPECIAL STRUCTURAL CHARACTERS.

Dorsal space broad, narrowing slightly toward the extremities, ending behind in the broadly quadrate joint 13, not strongly arched. Lateral space broad, oblique, scarcely concave, narrowing a little toward the extremities. Subventral space small, contracted. Ridges at first prominent and tubercular, setiferous, later smooth, granular, the subdorsal ridge formed only by the change in slope between back and sides. Setæ of Stage I single, on the thorax ia–iib and iv, on abdomen i–iii converted into tapering spines with expanded trifid tips, the upper two on joints 4–12 united into a single spine of which one seta forms a knot-like prominence on the other, exactly as in *A. y-inversa.* These setæ lean in alternating directions. Later the warts are represented by short setæ, normal in number, not united together; in the last stage almost entirely absent. Depressed spaces fairly well developed, small, but not very sharply defined, but all present (1)–(8). Skin at first smooth, later with secondary spines on the tubercles and conical granules, finally uniformly covered with round clear granules. After the last molt the specific white coloring definitely appears, of the same general character as *A. y-inversa.* There are six or seven stages. In the former case the stage before the last as here described is omitted.

AFFINITIES, HABITS, ETC.

This larva does not differ structurally from *A. y-inversa* with which it is strictly congeneric, and the same remarks will apply to both species. (See Journ. N. Y. Ent. Soc. III, 152.) In color it is the same whitish

green as its ally, but differs in the absence of the transverse yellow line on joint 3.

The eggs are laid singly on the lower branches of the oak, its only food plant. The larvæ feed in Stage I eating the parenchyma from below in little patches. The moths emerge at the end of June, my examples all appearing between the 25th and 29th of that month. The males separate from the females before morning and are not found in copulation during the day. The species is single brooded, mature larvæ occurring in the middle of August and into September.

This is the larva originally described by me as *A. y-inversa.* (See Journ. N. Y. Ent. Soc. III, 153 and V, 2.) I found them rarely at Plattsburgh, Clinton Co., and on Esopus Island in the Hudson River opposite Hyde Park, Dutchess Co. They were unusually abundant at Bellport, Long Island, in the summer of 1896 and I bred them in some numbers with the kind assistance of Mr. L. H. Joutel, who kept the cocoons over winter for me.

Description of the Several Stages in Detail.

Egg.—Elliptical, rather opaque whitish, white on both glass and leaf; 1.2 x .7 mm. Reticulations very small and obscure, irregularly quadrangular. They hatch in 7 to 8 days.

Stage I. (Plate IX, fig. 1.)—Distinctly segmented, opaquish white, the spines whiter. Rounded and narrowed behind, truncate before, highest in front. Dorsal and lateral spaces moderate, flat, not hollowed; ridges slight. No marks except a large black spot on the head, which consists of a patch of pigment below the skin of joint 2 and is visible even to the naked eye. Head smoky, especially on the vertex, the sutures of clypeus black; mouth brown, a pale area around it. When retracted, the head looks black. Setæ long, slender with broadened bases, tapering, the subdorsal row of joints 4–12 with distinct side prongs, one-third the length of the other limb. Tips enlarged and cleft. Basal two-thirds of seta milky white, apex transparent, smooth, becoming black. On joint 3 five setæ, the same on joint 4 but the upper two consolidated. The lateral seta of joint 5 leans upward and the subdorsals of joints 5, 7, 9 and 11 lean outward, alternating with the others. Two simple subdorsal setæ on joint 13. Skin smooth, slightly shining. Later the larva is very shiny, a hollow appears above the base of each subdorsal tubercle in the dorsal space and a distinct white line under the skin along subdorsal and lateral ridges. Spines no longer conspicuously white. Length .9–1.5 mm. The larvæ feed in this stage. Duration about 5 days.

Stage II. (Plate IX, fig. 2.)—Blunt, squarish, highest at joints 5–6. Pale green, a whitish line along subdorsal ridge, a little wavy. Subdorsal tubercles on joints 3–13 and middle ones on joints 3 and 4 conical, clear, with two black setæ each; lateral row on joints 3–12 with one seta, all with small, short, colorless, secondary setæ with blunt tips. Skin with sparse watery granules (Plate IX, fig. 6). Largest depressed spaces indicated. The primary setæ are conic and sharp tipped, the secondary ones bulbous. The dorsal space appears as a dark green band from the food showing by transparency. Length 1.5 to 2.5 mm.

Stage III.—Thickly conic, clear granular, otherwise as before. The dorsal depressed spaces show faintly as whitish dots. Subdorsal line more distinct, nearly straight; lateral tubercles setose. Head about .4 mm. wide, whitish, eye black, mouth brown. Length 2.4–3.5 mm. Duration 4 days.

Stage IV.—Elliptical with square tail. Dorsal space flat; lateral concave, subventral, short. Subdorsal ridge slight, lateral one well marked. No subdorsal tubercles, setæ arising from the ridge, two dark stiff ones on each segment with no secondary setæ. On the lateral ridge, low raised tubercles with some secondary setæ. Skin densely clear granular, the granules slightly conic. Color green, a yellow line along the subdorsal ridge on joints 3–13, not joining each other at either end. A distinct dorsal row (with dark centers) and a fainter lateral row of whitish intersegmental dots. Head .5 mm. wide, pale, eye black. Later the ad-dorsal depressed spaces are indicated, and a darker green shade appears above and below the subdorsal line. Length 3.5–4.6 mm.

Stage V.—Ridges even, not tubercular; skin densely clear granular, the granules large, conic, especially large along the lateral ridge, but no longer setiform. Setæ of both ridges black, arising from the ridge. Dorsal (1), addorsal (2), small ones below the ridge (3), large lateral (4), upper segmental (5) and lower inter-segmental (6) white dots, the two largest (1) and (4), dark centered, all these areas smoother than the skin between, lacking the granules in a small space, not much deepened, the edges graded and obscure. Body elliptical, tail quadrate, notched on the sides. Dorsal, and upper half of lateral space pigmented, green; below this transparent leaf green; a broad yellow subdorsal line on joints 3–13, dark edged above and below. The larva looks much smoother than before. Length 4.5–6.5 mm.

Stage VI.—Head about 1.3 mm., green, eye black. Body smooth, no setæ perceptible with a lens except the two pale ones of subventral row

(iv and v) which look long. Skin densely clear granular, the granules large, coarse, conic as before, but less sharply pointed and situated more closely along the lateral ridge. Tail quadrate, slightly laterally notched. Color whitish green, a broad yellow line along the subdorsal ridge, very slightly waved, edged with dark green as before. A faint white line along subventral edge. All the depressed spaces (1) to (6) indicated by yellowish dots, small, shallow, only (1) with a rather sharp edge and fine granular bottom, the others nearly covered by the large bordering granules. Subventral space very finely granular. Spiracles round, whitish, normal, in line. Later the color becomes gradually whiter, the subdorsal lines approach each other at the ends, but are separated by a space of .5 mm. No transverse line on joint 3. Length 6.3–9.5 mm. Duration of the stage 8 days.

Stage VII.—(Plate IX, fig. 8). Shape as described above. Skin closely clear granular, frosted. Whitish green, clearer on joints 3–5; broad subdorsal lines pale yellow, edged with dark green above and less distinctly so below; an obscure whitish subventral line. Subdorsal lines free at the ends. Depressed spaces whitish, not contrasting, (1) and (4) faintly dark centered. Granules rounded, not conic as before; not contiguous, but the sides a little angularly adapted to each other. Depressed spaces very small, the smallest, as (2), covered over by the granules which are a little smaller there than elsewhere. Space (1) a small elliptical smooth area. Setæ inperceptible. The shape is as in *A. y-inversa* except that the lateral ridge is more prominent, exceeding the subventral ridge. Length 9.5–12 mm.* Duration of the stage 7 days.

Cocoon and pupa as usual.

Food-plants.—Oak. Usually on *Q. alba*, less commonly on other oaks.

EXPLANATION OF PLATE IX.

Fig. 1. Larva in stage I, dorsal view, enlarged × 60.
" 2. Larva in stage II, side view, enlarged × 30.
" 3. Larva in stage VII, front view, enlarged.
" 4. The same, side view.
" 5. Moth of *Apoda biguttata*, natural size.
" 6. Granules of stage II, enlarged.
" 7. Larva in stage VII, early in the stage, dorsal view.
" 8. Larva in stage VII, mature.
" 9. Granules of stage V enlarged, from area of subdorsal ridge.
" 10. The same, stage VI.

* A larva with six stages had the following lengths: I, .9–1.5 mm., II, 1.5–2.4 mm., III, 2.4–3.6 mm, IV, 3.6–5.5 mm., V, 5.5–8.4 mm, VI, 8.0–11.2 mm.